FEMTOSECOND MULTI-PHOTON IONIZATION VIA SHORT-LIVED RESONANCES

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Many aromatic molecules have strong, broad absorption features in the far UV. These resonances belong to highly excited electronic states with very short lifetimes, reflecting either ultrafast intramolecular relaxation, or dissociation of the molecule. We demonstrate experimentally that such short-lived resonances can be used for multi-photon ionization provided that the excitation pulse is on a femtosecond time scale. We ionize phenol via the S_2 electronic state at wavelengths near 206 nm. The time-of-flight photoelectron spectrum is highly congested and unresolved, but indicates that about 0.5 eV of energy is deposited into the ion in the course of the two-photon ionization process. The mass spectrum reveals minimal fragmentation.